TRAINING PROGRAM OF INSTRUCTION (TPI)

FOR

DINFOS-BTVEM

BASIC TELEVISION EQUIPMENT MAINTENANCE COURSE

Approved by:

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Commandant Defense Information School
Supersedes DINFOS-BTVEM-USA/ DINFOS-BTVEM-USAF TPI dated Feb. 2006 and DINFOS-EFC TPI dated May 2006

BASIC TELEVISION EQUIPMENT MAINTENANCE COURSE
TRAINING PROGRAM OF INSTRUCTION
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TRAINING PROGRAM OF INSTRUCTION

Preface

TRAINING PROGRAM OF INSTRUCTION FILE NUMBER (TPFN): DINFOS-BTVEM

UNIT TITLE: Basic Television Equipment Maintenance Course

TRAINING LOCATION: Defense Information School, Fort George G. Meade, Maryland

SPECIALTY AWARDED: USA MOS 25R10

PURPOSE: To provide a course of instruction that fulfills the training requirements for MOS 25R10. Designed to take foundational electronic material and add to it the basic entry-level concepts and practical skills required to maintain and repair the major components of television equipment systems.

COURSE DESCRIPTION: This course provides instruction and training on direct and alternating current principles, solid-state fundamentals, transistor amplifier theory, digital principles, and basic soldering techniques. Students then apply these basic electronic concepts to the maintenance and repair of broadcast television/radio equipment. At the conclusion of this course, the graduate will be able to use audiovisual test equipment to monitor, troubleshoot, and repair monitors, receivers, television cameras, videotape recorders, audio systems, broadcast studios, automated audio and visual equipment, as well as transmission systems. Additionally, graduates will be able to set-up and maintain Video Teleconferencing and collaboration systems. This course is designed for entry-level service members and is an MOS producing course. This TPI combines all of the functional areas previously taught in the Electronic Fundamentals course with the functional areas taught in BTVEM-USA/USAF courses, any reduction in hours reflect the redistribution of training hours in accordance with current Army needs and does not modify the training intent of either course. This TPI satisfies all requirements for both EFC and BTVEM.

TRAINING METHODOLOGY: The BTVEM course is a resident format only, taught locally at the Defense Information School in its entirety.

PREREQUISITES: Target population/prerequisite(s) waiver requests must come through the Army's career field manager to the DINFOS Commandant, for approval.

Service	**Rank / Identifier / Etc**	**Other**
ARMY	E1 through E6	Minimum EL score of 107 on the ASVAB; have normal color vision; profile series: PUHLES 212221; cannot experience acrophobia, claustrophobia, or vertigo; and be able to lift 75 lbs.
Other Services Do Not Attend This Course		
International students	Must have an English Comprehension Level (ECL) of 75, have normal color vision, cannot have acrophobia, be claustrophobic, or have vertigo. Until EFC and BTVEM are formally merged, EFC must be completed prior to BTVEM.	
Interagency	Student's pay-grade, duty position description, and selection in accordance with specific agency guidance, policy and procedures.	

SECURITY CLEARANCE: None

CLASS SIZE:

MAXIMUM: 8

MINIMUM: 4

ANNUAL COURSE CAPACITY: 48

COURSE LENGTH: 124 training days

ACADEMIC HOURS:	976
ADMINISTRATIVE HOURS:	16
TOTAL COURSE HOURS:	992

INSTRUCTOR CONTACT HOURS: 1169

TYPE/METHOD OF INSTRUCTION:

LECTURE (L):	200 Hrs
DEMONSTRATION (D)	83 Hrs
PERFORMANCE EXERCISE (PE):	424 Hrs
PERFORMANCE EXAMINATION (EP):	70 Hrs
WRITTEN EXAMINATION (EW):	51 Hrs
COMPUTER AIDED INSTRUCTION (CAI):	148 Hrs
ADMINISTRATIVE (AD):	16 Hrs

TRAINING START DATE: October 2008

ENVIRONMENTAL IMPACT: None, DoD policy was followed to assess the environmental impact.

MANPOWER: The Interservice Training Review Organization (ITRO) formula was used to determine the number of instructors required.

EQUIPMENT AND FACILITIES: The Course Design Resource Estimate (CDRE) contains this information.

TRAINING DEVELOPMENT PROPONENT: Defense Information School, Course Development Department, (301) 677-4420; DSN 622-4420

OVERVIEW FUNCTIONAL AREA 1
FUNDAMENTALS OF ELECTRONICS

TPFN: DINFOS BTVEM-001

UNITS:

001	Introduction to Electronics
002	Basic Circuits and Components
003	Solid State Electronics
004	Amplifier Circuits
005	Waveshaping Circuits
006	Basic Digital Electronics
007	Circuit and Connector Fabrication

Terminal Training Outcome: The instruction and training throughout this functional area provides students with the foundational knowledge of electronics required for them to understand and perform the hands-on troubleshooting techniques practiced in later units. Upon completion of this functional area, the student will be able to identify and apply the primary principles of safety hazards associated with electronic equipment. Students will be able to use test equipment to make basic circuit measurements, perform conversions using metric notation and electrical prefixes, perform math operations using powers of ten, and perform circuit analysis using component theory. Students will be able to identify basic principles of and troubleshoot resistors, switches, fuses, breakers, inductors, capacitors, transformers, relays, solenoids, diodes, transistors, power supplies, and voltage regulators. Additionally, students will be able to calculate values and troubleshoot AC/DC circuits, resistive-capacitive- inductive circuits, basic and multistage transistor amplifier circuits, operational amplifier circuits, oscillator circuits, multivibrator circuits, trigger device circuits, combinational logic circuits, register memory circuits, arithmetic counting circuits, and conversion and data circuits. Student will be able to identify electronic cables and connectors, perform electronic soldering and de-soldering techniques, and test electronic cable terminations. Student competency is measured through written exams, hands-on experiments, and practical exercises. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

FA HOURS AND TYPES:

Computer Aided Instruction (CAI)	148 Hrs
Practical exercise (PE)	112 Hrs
Written exam (EW)	25 Hrs

FA TOTAL HOURS: 285

FUNCTIONAL AREA 1
FUNDAMENTALS OF ELECTRONICS

TPFN: DINFOS-BTVEM-001-001-

UNIT TITLE: Introduction to Electronics

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using an electronic laboratory program, students identify and troubleshoot the basics components of an electrical circuit. Students are introduced to the CAI electronic lab program, which is used extensively during the electronic fundamentals training of this course. Students thoroughly examine all safety requirements and hazards associated with electronics and perform metric conversion and math operations using scientific notation. Students then move on to identifying the basics of voltage, current, and the components of an electrical circuit as well as, identifying principles of resistors, switches, fuses and circuit breaker. Students also perform circuit analysis using test equipment. Students trace signals, voltage, and current through an operational circuit and troubleshoot the circuit to identify faulted components. This foundational information is applied to all subsequent lessons and is essential to the students' successful completion of this course; therefore, it is reinforced and reviewed throughout the course. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 14 CAI; 36 PE; 4 EW

TPFN TOTAL HOURS: 54

PREREQUISITE TPFN: None

TASK(S):

001	Introduction to Computer Aided Instruction
002	Identify & comply with safety applicable to electronics
003	Identify equipment used in electronics
004	Use test equipment to make basic circuit measurements
005	Written exam 1
006	Perform conversions using metric notation and electrical prefixes
007	Perform math operations using powers of ten (scientific notation)
008	Perform circuit analysis using component theory
009	Identify resistor operating principles
010	Troubleshoot a resistor
011	Identify basic facts and principles of switches, fuses and breakers
012	Written exam 2

REFERENCES:

- CAI software and accompanying texts

INSTRUCTOR/STUDENT RATIO: 1:8 CAI, EW; 1:4 PE

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 1
FUNDAMENTALS OF ELECTRONICS

TPFN: DINFOS-BTVEM-001-002-

UNIT TITLE: Basic Circuits and Components

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using an electronic laboratory program, the student uses test equipment to analyze and troubleshoot DC, AC, inductive, capacitive, and RCL circuits down to the component level. Students identify, analyze, and calculate mathematical formulas to identify electronic faults in a circuit. During this process, the student also identifies the relationships between voltage, current, and resistance in these circuits. Students identify AC sinusoidal and non-sinusoidal waves, frequency, cycle, and hertz. Students define the characteristics and the unit of measurement for resistance, capacitance, and inductance. Students identify sine waves and calculate wavelength, period, peak, peak-to-peak, average, and RMS values. Students identify the in-phase and out-of-phase waveforms, magnitude, and degree of an AC waveform using vectors. Students use an oscilloscope, signal generator, multimeters, and frequency counters to measures basic electronic signals, and electronic component values. This foundational information is applied to all subsequent lessons and is essential to the students' successful completion of this course; therefore, it is reinforced and reviewed throughout the course. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 26 CAI; 25 PE; 5 EW

TPFN TOTAL HOURS: 56

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Identify DC characteristics
002 Calculate unknown values in a DC circuit
003 Troubleshoot a DC circuit
004 Identify AC characteristics
005 Written exam 1
006 Identify inductor operating principles
007 Troubleshoot an inductive circuit
008 Identify capacitor operating principles
009 Troubleshoot a capacitive circuit
010 Identify filter circuits
011 Identify resistive-capacitive-inductive (RCL) resonant circuit operating principles
012 Troubleshoot an RCL circuit
013 Written exam 2

REFERENCES:

- CAI software and accompanying texts

INSTRUCTOR/STUDENT RATIO: 1:8 L, EW; 1:4 PE

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 1
FUNDAMENTALS OF ELECTRONICS

TPFN: DINFOS-BTVEM-001-003-

UNIT TITLE: Solid State Electronics

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using an electronic laboratory program, the student uses test equipment to analyze and troubleshoot solid-state devices in a circuit. Students identify, analyze, and calculate mathematical formulas to identify electronic faults in solid-state devices and replace electronic components in a circuit. Students identify purpose, schematic symbols, reference designations, and operating characteristics of relays, solenoids, diodes, transistors, variable resistors, ICs, and voltage regulators. Students review typical faults in transformers, clippers, clampers, and diodes; practice troubleshooting procedures; and then troubleshoot a circuit with these components. They also identify biasing for PNP and NPN transistors and operation from cutoff to saturation. Students identify power supply and voltage regulator faults, troubleshooting procedures, and then perform troubleshooting experiments. Students identify purpose and classes of amplifiers, specifically common emitter, common collector, and common base amplifier configurations. This foundational information is applied to all subsequent lessons and is essential to the students' successful completion of this course; therefore, it is reinforced and reviewed throughout the course. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 24 CAI; 11 PE; 5 EW

TPFN TOTAL HOURS: 40

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Identify transformer operating principles
002 Troubleshoot a transformer circuit
003 Identify basic facts and principles of relays
004 Identify basic facts and principles of solenoids
005 Troubleshoot a relay circuit
006 Troubleshoot a solenoid
007 Identify solid state diodes operating principles
008 Troubleshoot a basic diode circuit
009 Written exam 1
010 Identify characteristics and principles of a transistor circuit
011 Identify operational characteristics and functions of power supplies
012 Troubleshoot a faulty power supply
013 Identify power supply voltage regulator operation principles
014 Troubleshoot a voltage regulator
015 Written exam 2

REFERENCES:

- CAI software and accompanying texts

INSTRUCTOR/STUDENT RATIO: 1:8 L, EW; 1:4 PE

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 1
FUNDAMENTALS OF ELECTRONICS

TPFN: DINFOS-BTVEM-001-004-

UNIT TITLE: Amplifier Circuits

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using an electronic laboratory program, the student uses test equipment to analyze and troubleshoot amplifier circuits to the component level. Students identify purpose and classes of amplifiers, specifically common emitter, common collector, and common base amplifier configurations. They perform operational checks of these amplifiers including observing waveforms. They also identify biasing for PNP and NPN transistors and operation from cutoff to saturation. Students identify typical faults found in operational amplifier circuits, troubleshooting procedures used to correct them, and then participate in troubleshooting experiments. Students also identify basic facts and principles; recognize schematic symbols and operating characteristics of special purpose devices, multi-stage, RC coupled, and push-pull transistor amplifiers. Students then perform troubleshooting experiments in which they must recognize faults in these circuits and observe the affect these faults have on the circuit. This foundational information is applied to all subsequent lessons and is essential to the students' successful completion of this course; therefore, it is reinforced and reviewed throughout the course. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 21 CAI; 11 PE; 4 EW

TPFN TOTAL HOURS: 36

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001	Identify characteristics and principles of basic transistor amplifier circuits
002	Perform an operational check of a basic transistor amplifier circuit
003	Identify the characteristics and principles of multistage transistor amplifiers
004	Troubleshoot a multistage transistor amplifier circuit
005	Written exam 1
006	Identify statements concerning the characteristics & principles of special-purpose devices
007	Troubleshoot a circuit containing a special-purpose device
008	Identify statements concerning the characteristics & principles of operational amplifiers
009	Troubleshoot an operational amplifier circuit
010	Written exam 2

REFERENCES:

- CAI software and accompanying texts

INSTRUCTOR/STUDENT RATIO: 1:8 CAI, EW; 1:4 PE

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 1
FUNDAMENTALS OF ELECTRONICS

TPFN: DINFOS-BTVEM-001-005-

UNIT TITLE: Waveshaping Circuits

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using an electronic laboratory program, the student uses test equipment to analyze and troubleshoot waveshaping circuits to the component level. Students identify the basic facts and principles of wave shaping circuits, to include RC time constants operation. Using a multimeter and oscilloscope, students observe a capacitor charging and discharging to verify RC time constant measurements. Students perform RC circuit transient experiments, predicting the effects and measuring voltage and current waveforms across a capacitor. They identify typical faults in RC transient circuits, and troubleshooting procedures used to correct them before actually troubleshooting a basic wave shaping circuit. Students review the basic facts and principles of series, parallel, and resonant RCL circuits and unknown circuit values are calculated. Students identify characteristics and principles of sine waves, Colpitts, Hartley, RC phase, Sawtooth, blocking, and non-sine oscillators. After reviewing troubleshooting procedures for identifying faulted components, students troubleshoot an oscillator circuit. This foundational information is applied to all subsequent lessons and is essential to the students' successful completion of this course; therefore, it is reinforced and reviewed throughout the course. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 26 CAI, 8 PE, 2 EW

TPFN TOTAL HOURS: 36

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001	Identify the characteristics and principles of oscillators
002	Troubleshoot an oscillator circuit
003	Written exam 1
004	Identify the characteristics and principles of multivibrator circuits
005	Identify the characteristics and principles of trigger device circuits
006	Written exam 2

REFERENCES:

- CAI software and accompanying texts

INSTRUCTOR/STUDENT RATIO: 1:8 CAI, EW; 1:4 PE

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 1
FUNDAMENTALS OF ELECTRONICS

TPFN: DINFOS-BTVEM-001-006-

UNIT TITLE: Basic Digital Electronics

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using an electronic laboratory program, students examine components used in normal operation for digital circuits. Students identify NOT, AND, and OR gate functions and examine digital truth tables and Boolean symbols. Students also identify operation, logic symbols, and logic schematic representation of NAND, NOR, XOR, and XNOR gates in circuit operation. Students identify characteristics and principles of combinational logic circuits, including the definition of combinational logic, universal logic gates; and describe logic families, including TTL, CMOS, EL, and IIL logic. They use logic probes to analyze logic circuits and troubleshoot a logic circuit to predict the circuit logic state. Students examine register circuits and predict outputs, measure inputs and outputs, and identify normal circuit operations. Students identify the purpose of adder circuits and how they are used in addition, subtraction, multiplication, and division. Students also identify purpose and operational characteristics of ripple counters, up counters, down counters, 4-bit adders, and 4-bit subtractors as well as, flip-flops circuits, D/A and A/D conversion, data selector, and data distribution circuits. Students must identify the purpose of these circuits and recognize their normal operation. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 34 CAI, 3 PE, 3 EW

TPFN TOTAL HOURS: 40

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Identify the characteristics and principles of digital circuits
002 Identify principles of electrostatic discharge control to protect electronic components and circuits
003 Identify the basic facts and principles of logic gates
004 Identify the characteristics and principles of combinational logic circuits
005 Perform math operations using binary
006 Troubleshoot a logic circuit
007 Written exam 1
008 Identify the basic facts and principles of flip-flop circuits
009 Identify the characteristics and principles of register memory circuits
010 Identify the characteristics and principles of arithmetic counting circuits
011 Identify the purpose and operational characteristics of conversion and data circuits
012 Written exam 2

REFERENCES:

- CAI software and accompanying texts

INSTRUCTOR/STUDENT RATIO: 1:8 CAI, EW; 1:4 PE

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 1
FUNDAMENTALS OF ELECTRONICS

TPFN: DINFOS-BTVEM-001-007-

UNIT TITLE: Circuit and Connector Fabrication

UNIT INTERMEDIATE TRAINING OBJECTIVE: The student uses soldering equipment, test equipment, and cable connectors to fabricate various cables used in electronics. Students identify basic facts and principles of soldering and de-soldering as well as, tools, equipment, and materials used in this process. Preparation steps are explained and demonstrated for both solder and solderless connections. Students assemble wires, and components are soldered and de-soldered on printed circuit boards. Students also assemble solder and solderless connectors. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 3 CAI, 18 PE, 2 EW

TPFN TOTAL HOURS: 23

PREREQUISITE TPFN: All previous TPFNs

TASK(S):

001 Identify the basic facts and principles of soldering and desoldering
002 Solder and desolder wires and components on a printed circuit board
003 Assemble solderless connectors
004 Written exam

REFERENCES:

- None

INSTRUCTOR/STUDENT RATIO: 1:8 CAI, EW; 1:4 PE

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

OVERVIEW FUNCTIONAL AREA 2
FUNDAMENTALS OF TELEVISION

TPFN: DINFOS BTVEM-002

UNITS:

001	Electrical Power
002	Corrosion Control
003	Audio/Video Signals
004	RF Transmission
005	Video Test Equipment
006	New Technology

Terminal Training Outcome: The instruction and training throughout this functional area provides initial training in basic television principles. The student is taught standard safety practices, NTSC television signal characteristics, principles of transmission, equipment diagrams, and proper use of test equipment. Upon completion of this area, the student will be able to identify safety violations, analog and digital television signal properties; use equipment diagrams; and perform proper measurements of test signals. Student competency is measured through written exams, practical exercises, and performance exams. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

FA HOURS AND TYPES:

Lecture (L)	37
Demonstration (D)	6.5
Practical exercise (PE)	33.5
Performance exam (EP)	4
Written exam (EW)	5

FA TOTAL HOURS: 86

FUNCTIONAL AREA 2
FUNDAMENTALS OF TELEVISION

TPFN: DINFOS-BTVEM-002-001-

UNIT TITLE: Electrical Power

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using extracts from the Occupational Safety and Health Administration's (OSHA) regulations/guidelines and the DoD radiation hazard standard, the student identifies the dangers associated with radiation and electrical current to personal and equipment safety, the dangers of hazardous materials to personnel and the environment, and the OSHA and DoD standards of safety in the workplace. Additionally, students describe grounding for electrical operation, review international power polarization, and examine single and multiple phase power. Comprehension is measured with written evaluations. The student will also demonstrate the ability to apply these safety principles throughout the course during all daily classroom activities, including practice performances, performance evaluations, and examinations. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 6 L; 1 EW

TPFN TOTAL HOURS: 7

PREREQUISITE TPFN: None

TASK(S):

001	Describe AC power fundamentals
002	Identify electrical and equipment safety and hazards
003	Unit exam (written)

REFERENCES:

- OSHA 29 CFR,
- www.OSHA.gov

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 2
FUNDAMENTALS OF TELEVISION

TPFN: DINFOS-BTVEM-002-002-

UNIT TITLE: Corrosion Control

UNIT INTERMEDIATE TRAINING OBJECTIVE: The student identifies various types of corrosion and their causes; selects control methods used to prevent and treat corrosion; and identifies proper electronic equipment grounding techniques, how to detect grounding problems, and the consequences that arise from improper grounding. Comprehension is measured using written evaluations. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 2.L, 1 EW

TPFN TOTAL HOURS: 3

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Identify corrosion control fundamentals.

REFERENCES:

- www.OSHA.gov

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 2
FUNDAMENTALS OF TELEVISION

TPFN: DINFOS-BTVEM-002-003-

UNIT TITLE: Audio/Video Signals

UNIT INTERMEDIATE TRAINING OBJECTIVE: The student is introduced to basic concepts of composite video and audio to include the theories and identifiable characteristics of each. Students examine deflection and scanning, analog/digital video, fundamentals of color, digital signal processing and analog/digital audio in accordance with National Television Systems Committee standards. Emphasis is on analog video, as the student must achieve a firm comprehension of those essential concepts and characteristics. This information is necessary to ensure student success, as it is referenced extensively throughout the course. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 25 L, 1 EW

TPFN TOTAL HOURS: 26

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Identify basic principles of video signals
002 Identify basic principles of audio signals
003 Unit exam (written)

REFERENCES:

- Grob B. (1999). Basic Television and Video Systems (6th ed.) (pp. 38-61, 184-206, 308-326). McGraw-Hill
- Whitaker, J. (1999). National Association of Broadcasters: Engineering Handbook (9th ed.) (pp. 69-77, 82-84, 93-95, 268-469, 329-335, 675, 1152, 1163, 960, 1120, 1140, 1339, 1371) NAB

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 2
FUNDAMENTALS OF TELEVISION

TPFN: DINFOS-BTVEM-002-004-

UNIT TITLE: RF Transmission

UNIT INTERMEDIATE TRAINING OBJECTIVE: The student identifies frequency allocations in the radio frequency spectrum, and technical components and characteristics of transmitting AM/FM/TV/SW signals. Each student must achieve a firm comprehension of the TV transmission theory prior to entering the monitor functional area. The student participates in a guided discussion on the different types and characteristics of antenna systems. The student is also introduced to different types of data transmission and reception, as well as the fundamentals of a studio transmitter link. Comprehension is measured using written examinations. The student also applies this knowledge to demonstrate performance competencies throughout the monitor, studio, and transmission functional areas. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 3L; 1 EW

TPFN TOTAL HOURS: 4

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Identify RF transmission principles and theory (AM/FM/TV/SW).

REFERENCES:

- Grob B. (1999). Basic Television and Video Systems (6th ed.) (pp. 410-442). McGraw-Hill
- Whitaker, J. (1999). National Association of Broadcasters: Engineering Handbook (9th ed.) (pp. 6-29, 321, 525-543, 406-407, 475-476, 802-804) NAB

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 2
FUNDAMENTALS OF TELEVISION

TPFN: DINFOS-BTVEM-002-005-

UNIT TITLE: Video Test Equipment

UNIT INTERMEDIATE TRAINING OBJECTIVE: Students use a waveform monitor, vectorscope, oscilloscope, video test signal generator, multimeters, frequency counter, and a frequency signal generator to measures the composite video signals, basic electronic signals, and electronic component values. Students practice using all parts of this test equipment and measure and verify signals IAW FCC and NTSC standards. Each student must demonstrate proficiency by successfully completing individual performance evaluations in accordance with criteria developed from the manufacturer's manual for the purpose and use of each diagnostic tool. The student also applies this knowledge to demonstrate performance competencies throughout the rest of the course. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 6.5 D, 33.5 PE, 4 EP

TPFN TOTAL HOURS: 44

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Use test equipment for video measurements
002 Use radio frequency signal generator
003 Unit exam (performance)

REFERENCES:

- Manufacturer's manual:
  - Vectorscope
  - Waveform Monitor
  - Digital Multimeter
  - Analog Multimeter
  - Oscilloscope
  - Video Test Signal Generator
  - Frequency Counter

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns fires, and the use of tools and equipment.

FUNCTIONAL AREA 2
FUNDAMENTALS OF TELEVISION

TPFN: DINFOS-BTVEM-002-006-

UNIT TITLE: New Technology

UNIT INTERMEDIATE TRAINING OBJECTIVE: Through guided lecture and research, the student will discuss and identify emerging technologies. Comprehension of subject material is measured using a written evaluation. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 1 L, 1EW

TPFN TOTAL HOURS: 2

PREREQUISITE TPFN: None

TASK(S):

001 Access new technology initiatives.

REFERENCES:

- Grob B. (1999). Basic Television and Video Systems (6th ed.) McGraw-Hill
- Whitaker, J. (1999). National Association of Broadcasters: Engineering Handbook (9th ed.) NAB

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

OVERVIEW FUNCTIONAL AREA 3
CAMERAS/VIDEO TAPE
RECORDERS

TPFN: DINFOS BTVEM-003

UNITS:

001	Camera Principles
002	Camera Operations
003	Troubleshooting Principles
004	Camera Maintenance
005	VTR Principles
006	VTR Maintenance

TERMINAL TRAINING OUTCOME: The instruction and training throughout this functional area provides entry level training in basic operational theory, troubleshooting, and maintenance of both television cameras and video tape recorders. The student is taught signal tracing and video processing from origin to end user finished product. Upon completion of this functional area, the student will be able to identify optical principles, operate, maintain, and troubleshoot inclusive equipment to board level. Student competency is measured through written exams, practical exercises, and performance exams. Students must earn an aggregate score of at least 70 percent to complete this functional area successfully.

FA HOURS AND TYPES:

Lecture (L)	29
Demonstration (D)	7
Practical exercise (PE)	46
Performance exam (EP)	9
Written exam (EW)	5

FA TOTAL HOURS: 96

FUNCTIONAL AREA 3
CAMERAS/VIDEO TAPE RECORDERS

TPFN: DINFOS-BTVEM-003-001-

UNIT TITLE: Camera Principles

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using the manufacturer's manual, the student describes the fundamental concepts and components of camera optical systems, the basic principles and characteristics of images, and trace signals through the power supply, sync generator, video amplifier board, processor board, and encoder board. Students also examine digital signal processing principles. Comprehension is measured with a written evaluation. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 8 L, 2 EW

TPFN TOTAL HOURS: 10

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Identify basic principles of television cameras

REFERENCES:

- Sony, Charged Coupled Devices and related boards to camera operation
- Sony, DXC-D30L, Service manual, Vol. 1 1st Edition

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 3
CAMERAS/VIDEO TAPE RECORDERS

TPFN: DINFOS-BTVEM-003-002-

UNIT TITLE: Camera Operations

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using appropriate test equipment and the manufacturer's technical manual, the student removes and replaces the lens assembly, adjusts back focus and aligns tracking, and conducts an operational check in accordance with the manufacturer's technical manual. IAW the manufacturer's technical manual without error or safety violation. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 1 D, 7 PE, 1 EP

TPFN TOTAL HOURS: 9

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Adjust back focus and tracking.
002 Perform an operational check.
003 Unit exam (performance)

REFERENCES:

- Manufacturer's manual:
    - Camera block diagrams and schematics
    - Oscilloscope
    - Light box
    - Digital Multimeter
    - Waveform monitor
    - Vectorscope
    - Camera

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 3
CAMERAS/VIDEO TAPE RECORDERS

TPFN: DINFOS-BTVEM-003-003-

UNIT TITLE: Troubleshooting Principles

UNIT INTERMEDIATE TRAINING OBJECTIVE: The student uses block diagrams component diagrams, schematics and the logic flow diagram on equipment to practice basic troubleshooting principles. Students examine component symbols, their functions in a diagram and their unit of measure. Using symptom recognition, localization, the seven steps to troubleshooting, and a step-by-step process for troubleshooting, students isolate malfunctions down to the component level. Comprehension of subject material is measured with performance and written examinations. The techniques used in the unit are extremely important to the students' ability to pass this course. The student applies this knowledge throughout the course. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 5 L, 2 EW

TPFN TOTAL HOURS: 7

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Identify principles of troubleshooting

REFERENCES:

- Camera schematics
- Camera block diagrams

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 3
CAMERAS/VIDEO TAPE RECORDERS

TPFN: DINFOS-BTVEM-003-004-

UNIT TITLE: Camera Maintenance

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using the manufacturer's technical manual, the student identifies the principles of the television camera system and the alignments required for proper camera set-up. The students demonstrate proficiency by aligning the power supply, video preamplifiers, shading, gamma, encoder, and interface circuits without error. The alignments enhance the knowledge-based instruction for a total understanding of the camera. Additionally, students use test equipment, alignment tools, and the manufacturer's technical manual to troubleshot the camera and identify malfunctions to the module level. Performance measurement and evaluation is based on task completion without error, allowing for one instructor assist and no safety violations. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 4 D, 15 PE, 4 EP

TPFN TOTAL HOURS: 23

PREREQUISITE TPFN: All previous TPFNs

TASK(S):

001 Perform select television camera alignments
002 Troubleshoot a camera to module level.
003 Unit exam (performance)

REFERENCES:

- Manufacturer's manual:
    - Camera block diagrams and schematics
    - Oscilloscope
    - Light box
    - Digital Multimeter
    - Waveform monitor
    - Vectorscope
    - Camera

INSTRUCTOR/STUDENT RATIO: 1:4 (D, EP, PE)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 3
CAMERAS/VIDEO TAPE RECORDERS

TPFN: DINFOS-BTVEM-003-005-

UNIT TITLE: Video Tape Recorders (VTR) Principles

UNIT INTERMEDIATE TRAINING OBJECTIVE: Students identify the principles of magnetic recording; define terms used to identify magnetic properties and measurements; examine head theory and proper head drum handling. Students also examine the principles of analog and digital VTRs, which includes an analysis of the mechanical circuits, servo circuits, audio circuits, video/RF circuit, and the removal/replacement of a video head drum. Comprehension is measured with a written examination. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 16 L, 1 EW

TPFN TOTAL HOURS: 17

PREREQUISITE TPFN: All previous TPFNs

TASK(S):

001 Identify principles of magnetic recording
002 Identify principles of video tape recorders
003 Unit exam (written)

REFERENCES:

- Grob B. (1999). Basic Television and Video Systems (6th ed.) (pp. 410-442). McGraw-Hill
- VTR service manual
- Whitaker, J. (1999). National Association of Broadcasters: Engineering Handbook (9th ed.) NAB

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 3
CAMERAS/VIDEO TAPE RECORDERS

TPFN: DINFOS-BTVEM-003-006-

UNIT TITLE: VTR Maintenance

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using input signal, all appropriate test equipment, and manufacturer's technical manuals, the student performs operation checks, diagnostic checks, routine cleaning, and lubrication on a VTR. The student identifies the signal path through the circuits and performs mechanical, servo, audio, and video alignments IAW the manufacturer's guidelines and with no safety violations. The student uses symptom recognition and symptom localization to isolate a fault down to board level. Additionally, students practice removal and replacement of the loading tray and the pinch roller, as well as removal of stuck tapes. Comprehension is measured by performance exam. The student must perform each exam without safety violations and with limited instructor assistance. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 2 D, 24 PE, 4 EP

TPFN TOTAL HOURS: 30

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Perform VTR maintenance
002 Perform select VTR alignments
003 Troubleshoot VTR to board level
004 Unit exam (performance)

REFERENCES:

- VTR service manual, block diagrams, schematic, and alignment procedures
- Manufacturer's manuals:
    - Oscilloscope
    - Digital Multimeter
    - Waveform monitor
    - Vectorscope
    - Sync generator

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

OVERVIEW FUNCTIONAL AREA 4
AUDIO SYSTEMS

TPFN: DINFOS BTVEM-004

UNITS:

001 Audio Principles
002 Audio Test Equipment
003 Magnetic Recording
004 Audio Troubleshooting

TERMINAL TRAINING OUTCOME: The instruction and training throughout this functional area provides training in the basic principles of audio. The student is taught proper use and setup of audio equipment in accordance with established standards. Upon completion of this functional area, the student will be able to identify proper phase and amplitude levels for audio, troubleshoot to system level, identify problems, and implement basic measures to maintain a quality audio broadcast. Student competency is measured through written exams, practical exercises, and performance exams. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

FA HOURS AND TYPES:

Lecture (L)	17
Demonstration (D)	26.5
Practical exercise (PE)	14.5
Performance exam (EP)	5
Written exam (EW)	1

FA TOTAL HOURS: 64

FUNCTIONAL AREA 4
AUDIO SYSTEMS

TPFN: DINFOS-BTVEM-004-001-

UNIT TITLE: Audio Principles

UNIT INTERMEDIATE TRAINING OBJECTIVE: In an audio studio with various recording, playback, storage, and amplification equipment, the student describes the path of the audio signal through the various devices and identifies the functions of each. Students also identify the circuit component schematic symbols, signal processing, and characteristics of analog and digital audio. Students identify basic principles of frequency response, impedance matching, signal to noise ration, and balance/unbalance signals. The student also examines pre-emphasis/de-emphasis, signal ground, and stereo signal phasing. Using different types of microphones and other selected pieces of audio equipment that have differing input and output specifications, the student chooses the correct type of microphone to use in different environments and describes the effects various environmental conditions have on producing or reproducing audio. The student will also identify modes of compression, analog to digital conversion, and digital audio interfacing. Additionally, students examine various connectors used with audio. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 17L, 1 EW

TPFN TOTAL HOURS: 18

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Identify principles of audio (analog/digital)

REFERENCES:

- ASG 100 operations manual
- Evans, A. McWhorter G., (2004) Basic Electronics (pp 18, 20:11, 23:13, 23:14) Master Publishing, Inc
- Marcus, (1973) Elements of Radio (6th Ed) (pp. 681-681), Prentice-Hall
- Whitaker, J. (1999) National Association of Broadcasters: Engineering Handbook (9th ed.) (pp 246, 275-320, 399-401, 455-456, 1367-1380) NAB

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 4
AUDIO SYSTEMS

TPFN: DINFOS-BTVEM-004-002-

UNIT TITLE: Audio Test Equipment

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using an audio signal generator, an audio analyzer, oscillators, and manufacturer's technical manuals, the student produces selected audio signals, analyzes those signals for proper output criteria, and diagnoses faulty equipment based on the signals produced. Comprehension of material will be measured using performance evaluations. The student must correctly use a test signal generator, analyze signals on the audio analyzer, and diagnose programmed faulty signals without error or safety violation. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: .5 D, 2.5 PE, 1 EP

TPFN TOTAL HOURS: 4

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Use audio test and measurement equipment.

REFERENCES:

- Manufacturer's manuals:
  - Audio Analyzer
  - Audio Generator
- Whitaker, J. (1999). National Association of Broadcasters: Engineering Handbook (9th ed.) (pp 1367-1380) NAB

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 4
AUDIO SYSTEMS

TPFN: DINFOS-BTVEM-004-003-

UNIT TITLE: Magnetic Recording

UNIT INTERMEDIATE TRAINING OBJECTIVE: Students review the principles of magnetic recording; identify principles of analog cassette and mini disk recording systems. The student performs operational checks IAW the manufacturer's manuals. The students also demagnetize heads and lubricate tape paths on a recording system with no errors or safety violations IAW the manufacturer's guidelines. Comprehension is measured using written and performance evaluations. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 1 D, 3 PE, 2 EP

TPFN TOTAL HOURS: 6

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Perform analog cassette / MD operational checks
002 Demagnetize heads and lubricate tape paths
003 Unit exam (performance)

REFERENCES:

- Evans, A. McWhorter G., (2004) Basic Electronics, Master Publishing, Inc
- Horn, (1993) Complete Guide to Digital Audio Tape, Tab Books
- Sony PCM-7010 page 2-4 thru 4-19
- Sony MDS-B5 page 2-1 thru 5-3
- TASCAM manual 122MK III page 6-15
- Whitaker, J. (1999). National Association of Broadcasters: Engineering Handbook (9th ed.) (pp 335-338, 896-906) NAB

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 4
AUDIO SYSTEMS

TPFN: DINFOS-BTVEM-004-004-

UNIT TITLE: Audio Troubleshooting

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using an audio analyzer, audio generator, associated test cables and manufacturer's manuals, students will troubleshoot and use symptom recognition and symptom analysis to localize and identify a malfunction in an audio studio to board level IAW the manufacturer's manuals with no safety violations and as defined on the performance checklist. The student identifies the features and operating functions of the audio distribution system. The student then performs an operations check, alignment, and troubleshoots the audio distribution system. Students also identify the features and operating functions of the console and the equalizer; performs an operations check; aligns the console and equalizer. Students then troubleshoot the console and equalizer. Comprehension is measured using written and performance evaluations. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 25 D, 9 PE, 2 EP

TPFN TOTAL HOURS: 36

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Troubleshoot an audio system

REFERENCES:

- Manufacturer's manuals:
  - audio analyzer
  - audio generator

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

OVERVIEW FUNCTIONAL AREA 5
MONITORS AND RECEIVERS

TPFN: DINFOS BTVEM-005

UNITS:

001	Monitor Principles
002	Monitor Maintenance
003	Receiver Principles
004	Receiver Maintenance
005	Monitor/Receiver Troubleshooting

TERMINAL TRAINING OUTCOME: The instruction and training throughout this functional area provides entry level training in basic operational theory, troubleshooting, and maintenance of black & white and color CRTs. The student is taught signal tracing and isolating faults to component level. Upon completion of this functional area, the student will be able to identify basic television principles, broadcast standards, and troubleshooting techniques. Student competency is measured through written exams, practical exercises, and performance exams. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

FA HOURS AND TYPES:

Lecture (L)	19
Demonstration (D)	6
Practical exercise (PE)	50
Performance exam (EP)	10
Written exam (EW)	2

FA TOTAL HOURS: 87

FUNCTIONAL AREA 5
MONITORS AND RECEIVERS

TPFN: DINFOS-BTVEM-005-001-

UNIT TITLE: Monitor Principles

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using a television monitor and appropriate diagrams, the student identifies the signal path through the monitor's cathode ray tube (CRT). The student also analyzes monitor operations to identify the signal types and levels present at various points in the monitor. Comprehension is measured using written evaluations. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 13 L, 1 EW

TPFN TOTAL HOURS: 14

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Identify principles of monitor operation

REFERENCES:

- Manufacturer's manuals:
  - Monitor with block diagrams and schematics
  - Oscilloscope
  - Radio Freq
  - Digital Multimeter

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 5
MONITORS AND RECEIVERS

TPFN: DINFOS-BTVEM-005-002-

UNIT TITLE: Monitor Maintenance

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using alignment tools, test equipment, and the manufacturer's manual, the student performs an operational check on the monitor, checks the power supply circuits, and aligns the deflection circuit in accordance with the manufacturer's technical manuals and verified by correct operation of the monitor. Students adjust the vertical oscillator frequency range, vertical size, and vertical linearity flat face. The student is required to demonstrate proficiency of the circuit checks and alignments without error, in accordance with criteria extracted from the manufacturer's technical manuals, but may receive two instructor assists. Any safety violation results in a student being required to retest. Comprehension is measured using performance evaluations. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 1.5 D, 13.5 PE, 2 EP

TPFN TOTAL HOURS: 17

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Perform operations check on a monitor
002 Align (monitor) deflection circuits
003 Unit exam (performance)

REFERENCES:

- Manufacturer's manuals:
    - Oscilloscope
    - Radio Freq
    - Digital Multimeter
    - Monitor block diagrams and schematics

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 5
MONITORS AND RECEIVERS

TPFN: DINFOS-BTVEM-005-003-

UNIT TITLE: Receiver Principles

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using the technical manuals, block diagrams, circuit diagrams, and circuit component diagrams, the student identifies operational defects of a TV receiver by tracing signals through the various circuits. Emphasis is on identification of defective circuit components. Comprehension of subject material is measured using written evaluations. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 6 L, 1 EW

TPFN TOTAL HOURS: 7

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Identify principles of receiver operation.

REFERENCES:

- Manufacturer's manual/Receiver block diagrams and schematics

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 5
MONITORS AND RECEIVERS

TPFN: DINFOS-BTVEM-005-004-

UNIT TITLE: Receiver Maintenance

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using alignment tools, test equipment, and manufacturer's manuals, the student performs an operations check, examines the power supply circuits, and aligns the deflection and high voltage circuits in accordance with the manufacturer's technical manuals. Students locate proper grounds, input voltage, DC - DC converter, and signals within power supply circuits. Students also check the defection and high voltage signal, as well as align the deflection and high voltage circuits. Due to high voltages in this circuit, emphasis is on safety. Additionally, the student will review how to check and align convergence on a receiver and a projection television in accordance with the manufacturer's manual. The student is required to demonstrate proficiency of the circuit checks and alignments without error, in accordance with criteria extracted from the manufacturer's technical manuals, but may receive two instructor assists. Any safety violation results in a student being required to retest. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 4 D, 14 PE, 6 EP

TPFN TOTAL HOURS: 24

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Perform operations check on receiver
002 Examine power supply circuits
003 Align (receiver) deflection circuits
004 Align high-voltage circuits
005 Align convergence circuits (instructor demo)
006 Unit exam (performance)

REFERENCES:

- Manufacturer's manuals:
  - Oscilloscope
  - Radio Freq
  - Digital Multimeter
  - Receiver with block diagrams and schematics

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 5
MONITORS AND RECEIVERS

TPFN: DINFOS-BTVEM-005-005-

UNIT TITLE: Monitor/Receiver Troubleshooting

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using radio frequency signal generator, oscilloscope, multimeter, high voltage probe, associated test cables and the manufacturer's manuals, students will troubleshoot and identify a monitor/receiver. Student will use symptom recognition, symptom analysis, and localization to isolate an instructor inserted malfunction down to component level IAW manufacturer's manuals and with no safety violations. Due to high voltages in the CRT, emphasis is on safety. Student competency is measured through written exams, practical exercises, and performance exams. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: .5 D, 22.5 PE, 2 EP

TPFN TOTAL HOURS: 25

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Troubleshoot monitors to component level.

REFERENCES:

- Manufacturer's manuals
  - Oscilloscope
  - Radio Freq
  - Digital Multimeter
  - Receiver with block diagrams and schematics

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

OVERVIEW FUNCTIONAL AREA 6
STUDIO SYSTEMS

TPFN: DINFOS BTVEM-006

UNITS:

001 Studio Principles
002 Studio Installation
003 Studio Maintenance
004 Studio Troubleshooting

TERMINAL TRAINING OUTCOME: The instruction and training throughout this functional area teaches the student basic principles of maintaining and troubleshooting studios and studio equipment. At the conclusion of this functional area, the student will be able to maintain studio equipment, analyze problems, and monitor audio/video broadcast facilities. Student competency is assessed through written examinations, practical exercises, and performance examinations. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

FA HOURS AND TYPES:

Lecture (L)	11
Demonstration (D)	10
Practical exercise (PE)	61
Performance exam (EP)	11
Written exam (EW)	3

FA TOTAL HOURS: 96

FUNCTIONAL AREA 6
STUDIO SYSTEMS

TPFN: DINFOS-BTVEM-006-001-

UNIT TITLE: Studio Principles

UNIT INTERMEDIATE TRAINING OBJECTIVE: Students will identify and contrast various types of TV studios and the essential components within them, to include sync/test signal generator, character generator, video switcher, distribution amplifier, and time base correctors/frame synchronizers, and review NTSC signals. Students will examine each piece of equipment and review its purpose within the studio. Additionally, students will review NTSC standards, system timing, and studio design and planning. Comprehension is measured using written evaluations. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 11 L, 3 EW

TPFN TOTAL HOURS: 14

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Identify principles of studio systems

REFERENCES:

- Grass Valley Group, Inc., NTSC Studio Timing: Principles and Applications
- Whitaker, J. (1999). National Association of Broadcasters: Engineering Handbook (9th ed.) (pp 116-128, 875-888, 927, 953-955) NAB
- Manufacturer's manuals
    - Video Switcher
    - Character generator
    - Distribution amplifier
    - Test signal generator
    - Time base corrector/Frame synchronizer

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 6
STUDIO SYSTEMS

TPFN: DINFOS-BTVEM-006-002-

UNIT TITLE: Studio Installation

UNIT INTERMEDIATE TRAINING OBJECTIVE: In a television studio, students review signal grounding and power vs. signal routing. Students also route, dress, and label cables in a television studio. Comprehension is measured using written evaluations. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 4 D, 16 PE, 4 EP

TPFN TOTAL HOURS: 24

PREREQUISITE TPFN: All previous TPFN's

TASK(S):
001 Perform cable routing and dressing

REFERENCES: none

I**NSTRUCTOR/STUDENT RATIO:** 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 6
STUDIO SYSTEMS

TPFN: DINFOS-BTVEM-006-003-

UNIT TITLE: Studio Maintenance

UNIT INTERMEDIATE TRAINING OBJECTIVE: In a TV studio with multiple cameras, camera control units, a photometer, a white chart, and all appropriate test equipment, the student will perform an operations check of a studio and prepare a studio camera system. Students will properly light the studio, setting the iris control; master pedestal, black balance, and white balance for each camera and adjust color balance between cameras. Students also identify the functions of and perform operations check on all equipment within the studio; this includes sync/test signal generator, character generator, video switcher, distribution amplifier, an audio system, and a frame synchronizer. Additionally, the student aligns distribution amplifiers, the system's timing and phasing, and the subcarrier/horizontal phasing in a studio system. The student must perform each task IAW manufacturer's guidelines, using NTSC standards, with limited instructor assistance and with no safety violations. Proficiency of tasks is measured using a practical exercises and performance examinations. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 4 D, 16 PE, 3 EP

TPFN TOTAL HOURS: 23

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Prepare studio camera systems
002 Perform operations checks of a studio system
003 Perform alignments on a studio system
004 Unit exam (performance)

REFERENCES:

- Whitaker, J. (1999). National Association of Broadcasters: Engineering Handbook (9th ed.) (pp 833-842, 863-865, 875-886, 1039-1046) NAB
- Manufacturer's manuals
    - Video Switcher
    - Waveform Analyzer
    - Vectorscope
    - Character generator
    - Distribution amplifier
    - Test signal generator
    - Time base corrector/Frame synchronizer
    - Oscilloscope
    - Photometer
    - Camera

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 6
STUDIO SYSTEMS

TPFN: DINFOS-BTVEM-006-004-

UNIT TITLE: Studio Troubleshooting

UNIT INTERMEDIATE TRAINING OBJECTIVE: In a TV studio with various component items necessary to provide final audio and video signals, all appropriate test equipment, and manufacturer's technical manuals, the student will troubleshoot and identify problems with video, audio, and/or reference systems. Students will use specified troubleshooting techniques to accurately troubleshoot the studio system down to module level. The student is allowed one instructor assist, but must complete the exercise with no errors and no safety violations. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 2 D, 29 PE, 4 EP

TPFN TOTAL HOURS: 35

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Troubleshoot studio system to module level.

REFERENCES:

- Manufacturer's manuals:
  - Camera
  - Camera control unit
  - Video switcher
  - waveform analyzer
  - Vectorscope
  - Character generator
  - Distribution amplifier
  - Test signal generator
  - Time base corrector/Frame synchronizer
  - Oscilloscope

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

OVERVIEW FUNCTIONAL AREA 7
COMPUTERS & NETWORKING

TPFN: DINFOS BTVEM-007

UNITS:

001	Computer Principles
002	Computer Maintenance
003	Network Principles
004	Network Troubleshooting

TERMINAL TRAINING OUTCOME: The instruction and training throughout this functional area provides initial training in personal computers and networking. The student is taught basic computer theory and practice, and networking fundamentals. Upon completion of this functional area, the student will be able to build a personal computer, install basic software and operating systems, identify different types of networks, and troubleshoot hardware, software, and network problems. Student competency is measured through written exams, practical exercises, and performance exams. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

FA HOURS AND TYPES:

Lecture (L)	29
Demonstration (D)	4
Practical exercise (PE)	14
Performance exam (EP)	6
Written exam (EW)	3

FA TOTAL HOURS: 56

FUNCTIONAL AREA 7
COMPUTERS & NETWORKING

TPFN: DINFOS-BTVEM-007-001-

UNIT TITLE: Computer Principles

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using a desktop computer and references listed below, the student identifies basic computer principles. Students examine the operating system, input/output devices, audio/video card functions, and drives/storage functions of a computer. Comprehension is measured by written examination. Students must also be able to perform an operations check, assemble a PC, and troubleshoot to board level and perform protocol analysis without error. Comprehension is measured using written evaluations. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 16 L, 2 EW

TPFN TOTAL HOURS: 18

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Identify basic computer principles

REFERENCES:

- Mueller, S. (2007) PC Repair & Upgrade QUE
- Norton, P. (2002) New Inside the PC, SAMS
- White, R. (2001) How computers work, (6th Ed), QUE

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 7
COMPUTERS & NETWORKING

TPFN: DINFOS-BTVEM-007-002-

UNIT TITLE: Computer Maintenance

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using a desktop computer, operating system software, and manufacture's manuals, the student will perform computer maintenance. Students disassemble and assemble the computer, load an operating system, perform protocol analysis, and perform an operational check. Students also use tools, test equipment, and basic troubleshooting procedures to identify an instructor-inserted malfunction down to sub assembly level. All tasks are done IAW manufacturer's manuals, with no safety violations, within two hours and within tolerances. Comprehension is measured using practical exercises and performance evaluations. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 2 L, 2 D, 10 PE, 4 EP

TPFN TOTAL HOURS: 18

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Perform computer maintenance

REFERENCES:

- Manufacturer's manuals
  - PC
  - Protocol analyzer
- Mueller, S. (2007) PC Repair & Upgrade QUE

INSTRUCTOR/STUDENT RATIO: 1:8 (L) 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 7
COMPUTERS & NETWORKING

TPFN: DINFOS-BTVEM-007-003-

UNIT TITLE: Network Principles

UNIT INTERMEDIATE TRAINING OBJECTIVE: Students will identify principles of a LAN/WAN to include terminologies, types of computer networks, networking concepts and capabilities/limitations. Comprehension is measured using written evaluations. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 11 L, 1 EW

TPFN TOTAL HOURS: 12

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Identify principles of LAN/WAN.

REFERENCES:

- Mueller, S. (2007) PC Repair & Upgrade QUE
- Norton, P. (2002) New Inside the PC, SAMS
- White, R. (2001) How computers work, (6th Ed), QUE

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 7
COMPUTERS & NETWORKING

TPFN: DINFOS-BTVEM-007-004

UNIT TITLE: Network Troubleshooting

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using a desktop computer, operating software, Cat 5 cables, NIC cards, and access to a server, students will troubleshoot a network to assembly level. Students connect NIC cards to the PC, connect Cat 5 cables to NIC card, and connect cat 5 cables to a hub/switch. Students then configure the PC, check for continuity, and perform an operations check on the network. Students also use troubleshooting techniques to identify an instructor-inserted malfunction in the network to the assembly level. Task must be done IAW the manufacturer's manuals, with no safety violations, and within the tolerances defined on the performance checklist. Comprehension is measured using practical exercises and performance evaluations. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 2 D, 4 PE, 2 EP

TPFN TOTAL HOURS: 8

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Troubleshoot network to assembly level.

REFERENCES:

- Mueller, S. (2007) PC Repair & Upgrade QUE
- White, R. (2001) How computer work, (6th Ed), Que

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

OVERVIEW FUNCTIONAL AREA 8
COMPUTER-EMBEDDED SYSTEMS

TPFN: DINFOS BTVEM-008

UNITS:

001 Non-Linear Editing Systems
002 Audio Automation Systems
003 Video Teleconferencing Systems

TERMINAL TRAINING OUTCOME: The instruction and training throughout this functional area provides initial training in computer-embedded systems. The student is taught basic principles of non-linear editing, audio automation, and video teleconferencing equipment. Upon completion of this functional area, the student will be able to operate and troubleshoot a non-linear editing system, grasp the theory of audio automation, and establish a VTC network. Student competency is measured through written exams, practical exercises, and performance exams. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

FA HOURS AND TYPES:

Lecture (L)	14
Demonstration (D)	10
Practical exercise (PE)	45
Performance exam (EP)	8
Written exam (EW)	3

FA TOTAL HOURS: 80

FUNCTIONAL AREA 8
COMPUTER-EMBEDDED SYSTEMS

TPFN: DINFOS-BTVEM-008-001-

UNIT TITLE: Non-Linear Editing

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using a non-linear editing system and manufacturer's technical manuals, the students identify principles of non-linear editors, perform selected functions of non-linear editing, and conduct maintenance on a non-linear editing system. Students examine production, scripting, shooting, the edit decision list, A/D and D/A converter, and NLE software. Students also conduct power up procedure, digitize, edit, delete, and export files. Additionally, students perform maintenance on the software, hardware, interfacing equipment and media files transfer/storage systems. Competency of tasks is measured by written and performance exams. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 2 L, 6 D, 10 PE, 1 EW, 4 EP

TPFN TOTAL HOURS: 23

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Identify principles of non-linear editing.
002 Perform basic operations check on a non-linear editing system.
003 Perform maintenance on a non-linear editing system
004 Unit exam (performance)

REFERENCES:

- AVID manufacturer's manual for operations and maintenance
- AVID Express DV manual

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW) 1:4 (D, EP, PE)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 8
COMPUTER-EMBEDDED SYSTEMS

TPFN: DINFOS-BTVEM-008-002-

UNIT TITLE: Audio Automation Systems

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using manufacturer's manuals and all necessary equipment, students identify principles of, perform operations check, and do maintenance on an audio automation system. Students review the history of and identify software used in automated audio systems. Students also record and delete cuts, build a cart, create announcer stacks, create and load playlists, and check cue tone execution. Additionally, students perform software, hardware, and media file maintenance, as well as software management. Students' ability to perform these objectives are evaluated in written and performance exams IAW manufacturer's manuals with no safety violations. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 5 L, 3 D, 25 PE, 1 EW, 2 EP

TPFN TOTAL HOURS: 36

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Identify principles of operation of an audio automation system
002 Perform an operations check of an audio automation system
003 Perform maintenance on an audio automation system
004 Unit exam (performance)

REFERENCES:

- Manufacturer's manuals

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW); 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 8
COMPUTER-EMBEDDED SYSTEMS

TPFN: DINFOS-BTVEM-008-003-

UNIT TITLE: Video Teleconferencing Systems

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using manufacturer's manuals and all necessary equipment, students identify principles of and equipment used for Video Teleconferencing Conferencing (VTC) and establish a VTC across a network. Students first define what teleconferencing is, then they examine how to use teleconferencing as a communication tool, review system options, its limitations, and proper coordination for its setup. Students also examine how transmission for VTC is done, examine bridging technology, and review other collaboration tools. Additionally, students assemble/disassemble equipment, configure the camera and PC, operate VTC software, as well as establish and monitor communications. Student's ability to perform these objectives are evaluated in written and performance exams IAW manufacturer's manuals and no safety violations. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 7 L, 1 D, 10 PE, 1 EW, 2 EP

TPFN TOTAL HOURS: 21

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Identify principles of operation of VTC and collaboration software
002 Establish a VTC across a network

REFERENCES:

- Manufacturer's manuals

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW); 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

OVERVIEW FUNCTIONAL AREA 9
TRANSMISSION SYSTEMS

TPFN: DINFOS BTVEM-009

UNITS:

001	Transmitter Principles
002	Transmitter Test Equipment
003	Transmitter Maintenance
004	Transmitter Troubleshooting
005	Satellite Systems
006	Microwave Systems
007	Cable Head-End Systems

TERMINAL TRAINING OUTCOME: The instruction and training throughout this functional area teaches the student basic principles of maintaining and troubleshooting transmission systems. At the conclusion of this functional area, the student will be able to maintain transmission equipment, analyze problems, and monitor audio/video broadcasts. Student competency is measured through written exams, practical exercises, and performance exams. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

FA HOURS AND TYPES:

Lecture (L)	44
Demonstration (D)	7
Practical exercise (PE)	30
Performance exam (EP)	11
Written exam (EW)	4

FA TOTAL HOURS: 96

FUNCTIONAL AREA 9
TRANSMISSION SYSTEMS

TPFN: DINFOS-BTVEM-009-001-

UNIT TITLE: Transmission Principles

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using block diagrams and manufacturer's manuals, the student identifies fundamental concepts, principles and characteristics of transmission systems. In this unit, students examine principles of amplitude modulation, frequency modulation, television, and shortwave transmission. Students also examine antenna systems, antenna polarization, radiation patterns, and basic installation consideration for AM, FM, TV, and SW antennas. Additionally students review the connectors used in transmission such as N type, BNC, IDF, EIA flange, and more. Special emphasis is placed on safety due to the extreme hazards associated with transmitters. Comprehension is measured by written examination. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 16 L, 1 EW

TPFN TOTAL HOURS: 17

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Identify basic principles of transmitters

REFERENCES:

- CEA & NAB (2007), National Radio Systems Committee (NRSC-1) Interim Voluntary National Standards (pp 503-512) Washington D.C.: NAB
- CEA & NAB (2007), National Radio Systems Committee, (NRSC-2 Interim Voluntary National Standards (pp 513-523) Washington D.C.: NAB
- DoD AFRTS Engineering Standards and Practices handbook, CH 6
- Frenzel, L. (2007) Principles of Electronic Communication Systems (CH 1 Section 1-5, pp 15-17, 17-23, Section 1-6, pp 23-25, CH 2 Section 2-1, pp 40-51 Section 2-3, pp 69-82, CH 14, pp 630-678) McGraw-Hill
- Whitaker, J. (1999). National Association of Broadcasters: Engineering Handbook (9th ed.) (pp. 3-8, 11-17, 245-250, 475-502) NAB

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 9
TRANSMISSION SYSTEMS

TPFN: DINFOS-BTVEM-009-002-

UNIT TITLE: Transmitter Test Equipment

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using operational and technical manuals, the student safely operates equipment associated with transmitters. This includes a time domain reflectometer, sweep generator/spectrum analyzer, wattmeter, and a field strength meter. Students' ability to safely operate this equipment will be measured in a performance evaluation where students must pass all exercises with no safety violations. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 2 D, 5 PE, 2 EP

TPFN TOTAL HOURS: 9

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Utilize test equipment associated with transmission

REFERENCES:

- AFRTS-BTVEM Student Text, In-class handouts and slide presentation
- Corning Premises Optical Fiber Tutorial
- Frenzel, L. (2007) Principles of Electronic Communication Systems (chp 13 581-627, chp 19, pp 927-933) McGraw-Hill
- Whitaker, J. (1999). National Association of Broadcasters: Engineering Handbook (9th ed.) (pp. 245-259, 1265-1283, 1339-1363) Washington D.C.: NAB

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 9
TRANSMISSION SYSTEMS

TPFN: DINFOS-BTVEM-009-003-

UNIT TITLE: Transmitter Maintenance

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using appropriate test equipment and manufacturer's technical manuals, the student will conduct performance checks of a transmitter, align the exciter, align the antenna-coupling networks, and align the RF modulator. Additionally, students perform frequency tuning on an agile transmitter. Special emphasis is placed on safety due to the extreme hazards associated with transmitters. Proficiency is measured by performance examinations. The student must perform the checks and alignments IAW manufacturer's guidelines with no safety violations and with minimal instructor supervision/assists. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 2, D, 11 PE, 4 EP

TPFN TOTAL HOURS: 17

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Perform operations check on a transmitter
002 Align exciters.
003 Align antenna-coupling networks.
004 Align RF modulators.
005 Unit exam (performance)

REFERENCES:

- Manufacturer's manual

INSTRUCTOR/STUDENT RATIO: 1: 8 (D) 1:4 (PE EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 9
TRANSMISSION SYSTEMS

TPFN: DINFOS-BTVEM-009-004-

UNIT TITLE: Transmitter Troubleshooting

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using appropriate test equipment and manufacturer's technical manuals, the student will troubleshoot a transmitter. Students will use symptom recognition, symptom localization and fault isolation to identify an instructor inserted malfunction down to the module level. Proficiency is measured by performance examination. The student must identify the fault IAW manufacturer's guidelines without error or safety violations. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 2 D, 11 PE, 4 EP

TPFN TOTAL HOURS: 17

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Troubleshoot transmitter to component level.

REFERENCES:

- Transmitter Service manual block diagrams and schematic
- Manufacturer's manuals:
    - Audio signal generator
    - Oscilloscope
    - Multimeter
    - Dummy load
    - 20db Attenuator
    - Wattmeter
    - Modulation monitor

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 9
TRANSMISSION SYSTEMS

TPFN: DINFOS-BTVEM-009-005-

UNIT TITLE: Satellite Systems

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using manufacturer's technical manuals and block diagrams, the student will explain the characteristics of a satellite transmission system. This includes programming, digital modulation video compression techniques, and receiver/descramblers. Students trace the signal through a satellite system, explain the purpose of various circuits within the system, describe the signal characteristics during data transmission and reception, and describe how compression techniques are used in transmitting a signal over a satellite system. Comprehension is measured by written examination. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 8 L, 1 EW

TPFN TOTAL HOURS: 9

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Identify principles of satellite transmission systems

REFERENCES:

- AFRTS Broadcast Center Satellite Handbook V.2
- Frenzel, L. (2007) Principles of Electronic Communication Systems (chp 16, pp 757-799, 907-927) McGraw-Hill
- Grob B. (1999). Basic Television and Video Systems (6th ed.) (pp. 410-442). McGraw-Hill
- Whitaker, J. (1999). National Association of Broadcasters: Engineering Handbook (9th ed.) (pp. 397-431, 1285-1322, 1105-1182) Washington D.C.: NAB

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment

FUNCTIONAL AREA 9
TRANSMISSION SYSTEMS

TPFN: DINFOS-BTVEM-009-006-

UNIT TITLE: Microwave Systems

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using manufacturer's technical manuals, including block diagrams, the student will explain the signal path through selected major circuits of a microwave system, identify characteristics and elements of microwave transmitters, and define various types of studio-to-transmitter links. Students also discuss microwave-planning considerations such as conducting site surveys and frequency coordination. Comprehension is measured by a written examination. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 6 L, 1 EW

TPFN TOTAL HOURS: 7

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Identify principles of microwave transmission systems

REFERENCES:

- California Microwave manual, section 2 pp 2-1 thru 2-4
- Frenzel, L. (2007) Principles of Electronic Communication Systems (ch 14, pp 670-67) McGraw-Hill
- Grob B. (1999). Basic Television and Video Systems (6th ed.) (pp. 8-9). McGraw-Hill
- Whitaker, J. (1999). National Association of Broadcasters: Engineering Handbook (9th ed.) (pp. 609-631) Washington D.C.: NAB

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 9
TRANSMISSION SYSTEMS

TPFN: DINFOS-BTVEM-009-007-

UNIT TITLE: Cable Head-End Systems

UNIT INTERMEDIATE TRAINING OBJECTIVE: Using manufacturer's technical manuals and block diagrams, the student will examine the five major parts of a cable system, review signal quality and discuss rack assembly. This includes hardware as well as, routing and troubleshooting cables, discuss type, category, and characteristics of cable connectors. Additionally, students examine the signal path through cable distribution systems; describe correct cable routing and wiring harnesses; explain the fundamentals of fiber optic transmission; identify filters, combiners/mixers, pilot generators, and radio/TV modulators. Students also do a site survey and perform required calculations. The student uses this knowledge to wire a basic cable head-end system IAW manufacture's specifications and without any safety violations. Comprehension is measured by written and performance examinations. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN TYPE AND HOURS: 14 L, 1 D, 3 PE, 1 EW, 1EP

TPFN TOTAL HOURS: 20

PREREQUISITE TPFN: All previous TPFN's

TASK(S):

001 Identify principles of cable head-end systems
002 Wire a basic cable head-end system

REFERENCES:

- AFRTS-BTVEM Student Text, In-class handouts and slide presentation
- Corning Premises Optical Fiber Tutorial
- Frenzel, L. (2007) Principles of Electronic Communication Systems (chp. 19-3, CATV pp. 927-933, chp 13 pp. 581-627, chp 18) McGraw-Hill
- Student Text, In-class handouts and slide presentation
- Whitaker, J. (1999). National Association of Broadcasters: Engineering Handbook (9th ed.) (pp. 245-259, 1265-1283) Washington D.C.: NAB

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

OVERVIEW FUNCTIONAL AREA 10
FIELD TRAINING EXERCISE

TPFN: DINFOS BTVEM-010

UNITS:

001 Deployable Transmission Systems
002 Deployable Satellite Systems
003 Deployable Microwave Systems

Terminal Training Outcome: The instruction and training throughout this functional area teaches the student basics of maintaining and troubleshooting deployable transmission equipment. At the conclusion of this functional area, the student will be able to maintain deployable transmission systems, analyze problems, and monitor satellite uplinks/downlinks. Student competency is assessed through practical exercises and performance examinations. Student competency is measured through practical exercises and performance exams. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

FA HOURS AND TYPES:

Demonstration (D)	6
Practical exercise (PE)	18
Performance exam (EP)	6

FA TOTAL HOURS: 30

FUNCTIONAL AREA 10
FIELD TRAINING EXERCISE

TPFN: DINFOS-BTVEM-010-001-

UNIT TITLE: Deployable Transmission Systems

UNIT INTERMEDIATE TRAINING OBJECTIVE: In a field environment, using a wattmeter, router/switcher, waveform monitor, vectorscope, audio signal generator, video signal generator, AV monitor, parabolic dish, distribution amplifier, multimeter, patch panel, associated cables, and required manufacture's manuals, the students setup and perform operations check on a wire antenna system. Students conduct a site survey, ensure proper grounding of equipment, and coordinate transmission. Special emphasis is placed on safety due to the extreme hazards associated with transmitters. Proficiency is measured by performance examination. All procedures will be done IAW manufacturer's guidelines and safety protocols. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN HOURS AND TYPE: 2 D, 8 PE, 2 EP

TPFN TOTAL HOURS: 12

PREREQUISITE TPFN: All previous TPFNs

TASK(S):

001 Perform deployable transmitter set up and operations check.
002 Erect a wire antenna system.
003 Unit exam (performance)

REFERENCES:

- Manufacturer's manuals
    - TV transmitter
    - /FM transmitter
    - Wattmeter
    - Router/Switcher
    - Waveform monitor
    - Vectorscope
    - Audio signal generator
    - Video signal generator
    - AV monitor
    - Distribution amplifier
    - Multimeter
    - Patch panel

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must observe all safety precautions concerning the proper use of tools, equipment, and vehicles.

FUNCTIONAL AREA 10
FIELD TRAINING EXERCISE

TPFN: DINFOS-BTVEM-010-002-

UNIT TITLE: Deployable Satellite Systems

UNIT INTERMEDIATE TRAINING OBJECTIVE: In a field environment, using appropriate test equipment and manufacturer's technical manuals, students set up a parabolic dish, power up integrated satellite receiver decoder, and align the dish to acquire a satellite signal. After setting up the satellite, the student uses symptom recognition and symptom elaboration to localize an instructor-inserted fault down to module level. Special emphasis is placed on safety due to the extreme hazards associated with satellite systems. Proficiency is measured by performance examination. All procedures are done IAW manufacturer's guidelines, and safety protocols. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN HOURS AND TYPE: 2 D, 5 PE, 2 EP

TPFN TOTAL HOURS: 9

PREREQUISITE TPFN: All previous TPFNs

TASK(S):

001 Perform satellite acquisition
002 Perform troubleshooting procedures on microwave systems to module level.
003 Unit exam (performance)

REFERENCES:

- Manufacturer's manuals:
    - Microwave transmitter
    - Microwave receiver
    - Wattmeter
    - Router/Switcher
    - Waveform monitor
    - Vectorscope
    - Audio signal generator
    - Video signal generator
    - AV monitor
    - Parabolic dish
    - Distribution amplifier
    - Multimeter
    - Patch panel

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must observe all safety precautions concerning the proper use of tools, equipment, and vehicles.

FUNCTIONAL AREA 10
FIELD TRAINING EXERCISE

TPFN: DINFOS-BTVEM-010-003-

UNIT TITLE: Deployable Microwave Systems

U**NIT INTERMEDIATE TRAINING OBJECTIVE:** In a field environment, using appropriate test equipment electronic faults and manufacturer's technical manuals, students set up and align a microwave system. After setting up the microwave system, students use symptom recognition and symptom elaboration to localize an instructor-inserted fault down to module level. Special emphasis is placed on safety due to the extreme hazards associated with microwave systems. Proficiency is measured by performance examination. All procedures are done IAW manufacturer's guidelines, and safety protocols. Students must earn an aggregate score of at least 70 percent on all performance and written exams to complete this functional area successfully.

TPFN HOURS AND TYPE: 2 D, 5 PE, 2 EP

TPFN TOTAL HOURS: 9

PREREQUISITE TPFN: All previous TPFNs

TASK(S):

001 Perform microwave dish alignments.
002 Perform troubleshooting procedures on microwave systems to unit level
003 Unit exam (performance)

REFERENCES:

- Manufacturer's manuals:
    - Microwave transmitter
    - Microwave receiver
    - Wattmeter
    - Router/Switcher
    - Waveform monitor
    - Vectorscope
    - Audio signal generator
    - Video signal generator
    - AV monitor
    - Distribution amplifier
    - Multimeter
    - Patch panel

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must observe all safety precautions concerning the proper use of tools, equipment, and vehicles.

OVERVIEW FUNCTIONAL AREA 11
COURSE ADMINISTRATION

TPFN: DINFOS BTVEM-011

UNITS:

001 Course Administration

TERMINAL TRAINING OUTCOME: Students complete in-processing, out-processing, course critiques and graduate IAW with DINFOS POPMAN.

TPFN HOURS AND TYPES:

Administration (AD) 16

TPFN TOTAL HOURS: 16

FUNCTIONAL AREA 11
COURSE ADMINISTRATION

TPFN: DINFOS-BTVEM-011-001-

UNIT TITLE: Course Administration

UNIT INTERMEDIATE TRAINING OBJECTIVE: Self-explanatory

TPFN HOURS AND TYPE: 16 AD

TPFN TOTAL HOURS: 16

PREREQUISITE TPFN: N/A

TASK(S):

001 In-processing/orientation
002 Mid course critique
003 End of course critique
004 Out-processing RQM
005 Detachment out-processing
006 Graduation practice/ceremony
007 Out-processing

REFERENCES:

- DINFOS Policy and Procedures Manual

INSTRUCTOR/STUDENT RATIO: 1:8 (AD)

SAFETY FACTORS: N/A